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REQUIREMENTS FOR TARGET IDENTIFICATION TRAINING FOR THE ACOUSTI--ETC(U)
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REQUIREMENTS FOR TARGET IDENTIFICATION TRAINING FOR THE ACOUSTIC SENSOR OPERATOR

Sterling Pilette and Billy Biggs
HRB-Singer, Inc

and

Harold Martinek
Army Research Institute for the Behavioral and Social Sciences

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(10) Sterling Pilette and Billy Biggs
[redacted], Inc. Cold Pa.

and

Harold Martinek

Army Research Institute for the Behavioral and Social Sciences

(12) 50

Submitted by:
Edgar M. Johnson, Chief
Human Factors Technical Area

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Approved by:

Abraham H. Birnbaum, Acting Director
Organizations and Systems
Research Laboratory

Joseph Zeidner, Technical Director
U.S. Army Research Institute for
the Behavioral and Social Sciences

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ABSTRACT

The unattended ground sensor (UGS) operator in the field has few opportunities for formal training, or structured practice in identifying vehicles using the acoustic sensor. Actual operator performance levels are unknown. To assist in defining requirements, this research was designed to estimate the current performance level of operators under the ideal conditions of identifying vehicles traveling alone (not in convoys) using an acoustic sensor system with a high signal/noise ratio. In addition, the time required to identify a vehicle and the effects of additional training were investigated.

Twenty-four UGS operators identified 120 vehicle sounds which varied by type of vehicle (8) and length of time presented (1, 3, 6, 10, and 15 secs), received two hours of training, and then were retested on the original 120 sounds.

The training produced large increases in operator performance (average of 31%), and decreased the time required to identify a vehicle (from 15 seconds to 6). Practice effects were found, indicating that practice is needed in the field and that training research in this area must be designed so that training effects are not confounded with practice. Operators required 6-10 seconds to identify vehicles after training, depending on the specific vehicle type. Selection, using readily obtained measures of the top 1/3 of UGS operators for vehicle identification resulted in a 25% increase in performance over that of the "average operator."

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STATEMENT OF THE PROBLEM

Recent developments in the Army Unattended Ground Sensor (UGS) community have indicated a critical need for human factors research and training development in the area of acoustic sensor monitoring. The importance of training developments in improved operator performance is recognized by UGS field units, the United States Army Intelligence Center and School (USAICS), and in the exercise of the Avid Guardian Mission in Europe. The need for human factors research of parameters affecting the operator's ability to analyze an acoustic signal is especially crucial to evolving requirements of Avid Guardian and the Remotely Monitored Battlefield Sensor System (REMBASS).

Acoustic sensors are probably the best confirming type sensors in the Army today, but their full capabilities have not been utilized in the field primarily because operators lack training and the commanders do not know what this man/machine system can and cannot do. To successfully monitor acoustic sensors, the operator must be able to distinguish the audio signatures of various target types. At present, the USAICS provides extremely limited training on acoustic sensor analysis. Unless operators in the field are given a specific training program they typically have no opportunity to upgrade their skill level. The ability to distinguish sounds through a person's "acoustic memory" is one of the most difficult kinds of perceptual tasks. No one has investigated to what extent an operator's acoustic memory can be improved.

One conclusion of the AVID GUARDIAN Route Surveillance Study* is that "Additional research is needed to determine the audio sensor's utility in the

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*Avid Guardian Combined Surveillance Evaluation Group (CSEG), Second Interim Report, Route Surveillance Study (Part 2) 30 January 1976 (Report classified SECRET).

route surveillance role (unclassified)."

The two analog sensors AAU (Audio Add-on Unit) and COMMIKE are presently being used by the Army. The AAU is a non-commandable sensor which is attached to the MINISID III. The AAU can present 15 sec of audio after meeting the criteria of 3 seismic activiations within a 28 sec time span. The COMMIKE can be commanded by the operator when he believes a taget is present. The length of time the acoustic signals are transmitted affects:(1) battery life of sensor and relay; (2) probability of enemy detection; and (3) product cost of sensor. An additional problem cited with the AAU is that when transmitting it ties up the assigned frequency and thereby prevents the reception of signals from seismic sensors on that channel.

Vehicles can travel in two modes: alone and in convoy. A single vehicle's sound is not masked, distorted, or otherwise changed by the sounds of other vehicles. The "alone mode," although of operational value is the simpler of the two modes of travel. The research reported here deals only with vehicles traveling alone under good weather conditions. The effects on performance of transmission time, vehicle type, practice and training were investigated to determine training requirements. These requirements will be validated in future research.

Objectives

a. To measure the current level of UGS operators' ability to differentiate between the sounds of eight different types of military vehicles traveling alone.

b. To determine whether an operator can be trained (either formally or by practice) to increase his ability to differentiate between the sounds of military vehicles.

c. To investigate the effect of different transmission times on an operator's sound-recognition performance.

d. To determine ways of improving future sound-recognition training.

METHOD OF INVESTIGATION

Population and Sample

The population of concern was the Army enlisted UGS operator (MOS 17M20), school trained at the U.S. Army Intelligence Center and School at Fort Huachuca, AZ. Operators were 24 enlisted personnel of the 502 MI BN Remote Sensor Platoon stationed at Fort Hood, TX.

Apparatus

A UHER tape recorder, a feeder box, and ten headsets were used. The feeder box, which was connected to the UHER, enabled 10 people (eight operators and two facilitators) to listen to the training and the test scenario at the same intensity level.

Independent Variables

1. Training Effectiveness - The effectiveness of training was assessed by means of a baseline performance prior to training. After the training, the operators were tested again to determine if any improvement occurred.

2. Target Type - Eight types were tested: (1) a jeep; (2) a 3/4-ton truck; (3) a 2 1/2-ton truck; (4) a 5-ton truck; (5) an armored personnel carrier (APC); (6) an M48 tank; (7) a Cobra helicopter; and (8) an F-4 jet aircraft.

3. Transmission Time - The AAU uses a 15-second transmission time. For purposes of target identification, shorter transmission times may be effective against individual targets. Therefore, 1 sec, 3 sec, 6 sec, and 10 sec times were investigated in addition to the 15 sec. time.

Control Variables

These variables, of secondary interest, are important to determine the effects of practice.

1. Time - The pretest and posttest were each administered in three sections or periods. Each period was 15 minutes long with a 5-minute rest period between. Systematic improvement over the six periods would indicate a practice effect or a decrement would indicate fatigue effects.

2. Sets - During each of the three 15-minute periods, each operator identified one of three taped sets of 40 vehicle sounds. The sets of sounds were administered in the same sequence in both the pretest and the posttest.

3. Groups - Three groups of operators were randomly established with eight operators per group.

Dependent Variable

The dependent variable measured was target identification. The operator was asked to identify the specific target type of each sound presented. The percentage of targets correctly identified was used as the index of performance.

Research Design and Training Methodology

The research design is presented in Table 1. The three groups (N = 8 for each) received a baseline pretest, training, and a posttest using the same scenario, X, Y, or Z. Each scenario contained the same three sets of vehicle sounds presented in a different sequence (Table 2). Each set contained eight different vehicle sounds repeated across five different transmission times (1, 3, 6, 10 and 15 sec), for a total of 40 sound signatures randomly arranged within each set (Table 3).

After each group had been administered the pretest, they received a three-part training exercise. The parts were:

Part 1 - Single Target (Sound Signature) Training

Each operator received a fact sheet on each target. A discussion on the different sound characteristics was followed by a 5-minute familiarization run of each target in a "tandem fashion."

Table 1

Research Design

GROUP SUBJECT	PRETEST SCENARIOS		POSTTEST SCENARIOS
Group 1 (N = 8)	X	T R A I N I N G	X
Group 2 (N = 8)	Y		Y
Group 3 (N = 8)	Z		Z

Table 2

Order of Sets in Scenarios

PRETEST		POSTTEST	
SCENARIOS	Order of Sets	SCENARIOS	Order of Sets
X	2 3 1	X	2 3 1
Y	1 2 3	Y	1 2 3
Z	3 1 2	Z	3 1 2

TABLE 3

Sequence of Vehicle Sounds/Time For Sets Used in Scenarios

SEQUENCE	SET 1	SET 2	SET 3
1	F-4 - 1 sec.	JEEP - 3 sec.	5T - 10 sec.
2	JEEP - 6 "	2½T - 6 "	M48 - 10 "
3	M48 - 6 "	APC - 6 "	F-4 - 1 "
4	3/4T - 6 "	5T - 10 "	M48 - 6 "
5	M48 - 3 "	3/4T - 3 "	APC - 1 "
6	5T -15 "	M48 - 15 "	M48 - 3 "
7	3/4T -15 "	F-4 - 1 "	2½T - 1 "
8	3/4T -10 "	APC - 10 "	F-4 - 15 "
9	M48 -15 "	3/4T - 10 "	2½T - 6 "
10	APC -15 "	F-4 - 3 "	JEEP - 6 "
11	F-4 - 3 "	APC - 15 "	JEEP - 15 "
12	5T -10 "	5T - 1 "	2½T - 10 "
13	HELI -10 "	JEEP - 15 "	3/4T - 10 "
14	JEEP - 3 "	2½T - 3 "	HELI - 6 "
15	HELI -15 "	M48 - 1 "	2½T - 3 "
16	F-4 -15 "	M48 - 6 "	APC - 6 "
17	2½T - 1 "	APC - 3 "	JEEP - 10 "
18	3/4T - 1 "	F-4 - 15 "	M48 - 1 "
19	M48 - 1 "	3/4T - 1 "	F-4 - 10 "
20	2½T - 3 "	F-4 - 6 "	5T - 1 "
21	HELI - 6 "	3/4T - 15 "	3/4T - 3 "
22	APC - 1 "	HELI - 15 "	3/4T - 15 "
23	2½T -15 "	M48 - 3 "	M48 - 15 "
24	5T - 6 "	HELI - 1 "	3/4T - 6 "
25	HELI - 1 "	5T - 6 "	APC - 10 "
26	3/4T - 3 "	HELI - 10 "	F-4 - 6 "
27	M48 -10 "	JEEP - 1 "	APC - 15 "
28	F-4 - 6 "	HELI - 3 "	HELI - 10 "
29	5T - 3 "	JEEP - 10 "	JEEP - 1 "
30	APC - 6 "	2½T - 10 "	APC - 3 "
31	JEEP - 1 "	M48 - 10 "	HELI - 15 "
32	F-4 -10 "	5T - 15 "	JEEP - 3 "
33	JEEP -10 "	JEEP - 6 "	HELI - 1 "
34	2½T - 6 "	5T - 3 "	2½T - 15 "
35	5T - 1 "	2½T - 15 "	5T - 6 "
36	APC -10 "	HELI - 6 "	3/4T - 1 "
37	HELI - 3 "	2½T - 1 "	5T - 15 "
38	APC - 3 "	APC - 1 "	F-4 - 3 "
39	JEEP -15 "	3/4T - 6 "	5T - 3 "
40	2½T -10 "	F-4 - 10 "	HELI - 3 "

Part 2 - Paired Comparison (Target Sound Signature) Training

In this phase of the training, the operator was able to compare immediately, the sound signature of one target with that of the other. Twenty paired comparisons were presented.

Part 3 - Practical Exercise

In this phase, the operator practiced what he had learned about target sound signatures. The practical exercise comprised eight different vehicle sounds repeated at five different transmission times. After the 40 vehicle sounds were presented, the operators were given the answers and the exercise was replayed.

Scenario (Tape Construction)

The three pre/posttest scenarios were constructed using samplings of sound signatures from magnetic tapes collected from an exercise performed by the Mobile Equipment Research and Development Command (MERADCOM) of Fort Belvoir, Virginia, using high quality recording instrumentation. Sound samples from eight different vehicles were rerecorded using a filter (2000 cps) to simulate the operational bandwidth and a timer to produce the 5 intervals used in the experiment and a 15 second pause between signals.

The eight vehicles were:

1. an M151, jeep
2. an M201, 3/4 ton truck
3. an M35, 2 1/2 ton truck
4. an M543, 5 ton truck
5. an M113, armored personnel carrier
6. an M48, tank
7. a cobra helicopter
8. an F-4, jet aircraft

Since these sound samples were collected in a controlled exercise, vehicle type was known and could be related to individual sound signatures in the development of school solutions.

The scenarios consisted of the same three sets of sounds, presented in different orders to prevent confounding of time and order effects. Each set was composed of all possible combinations of the eight vehicle types and the five transmission times, randomly arranged. A 15 second pause was incorporated between each signal to allow for operator response.

Test Procedure

The training and test schedule is presented in Table 4. The test procedure was as follows:

(1) Orientation Briefing (see Appendix A)

(2) Test Procedure Training (see Appendix A)

(3) Pretest

(4) Target Familiarization Training (Appendix A)

(5) Posttest

The orientation briefing gave the operators an idea of the purpose of the research and a preview of the schedule of events. The operators were then administered the test procedure training, which was an active demonstration of test procedures and use of the target logs. The pretest was then given to the operators to assess their baseline performance. After the pretest, operators were given Parts 1, 2, and 3 of the training exercise, followed by the posttest.

TABLE 4

SCHEDULE OF ADMINISTRATION

Day 1 - Group 1

7:30 - 9:00	Classroom Set-up
9:00 - 9:30	Orientation and Test Procedure Training
9:30 - 11:00	Pretest
11:00 - 11:30	Training - Part I
11:30 - 13:00	Lunch
13:00 - 13:30	Training - Part I Cont'd
13:30 - 14:00	Training - Part II
14:00 - 14:30	Training - Part III
14:30 - 16:00	Posttest
16:00 - 16:30	Critique

Day 2 - Group 2

9:00 - 9:30	Orientation and Test Procedure Training
9:30 - 11:00	Pretest
11:00 - 11:30	Training - Part I
11:30 - 13:00	Lunch
13:00 - 13:30	Training - Part I Cont'd
13:30 - 14:00	Training - Part II
14:00 - 14:30	Training - Part III
14:30 - 16:00	Posttest
16:00 - 16:30	Critique

Day 3 - Group 3

9:00 - 9:30	Orientation and Test Procedure Training
9:30 - 11:00	Pretest
11:00 - 11:30	Training - Part I
11:30 - 13:00	Lunch
13:00 - 13:30	Training - Part I Cont'd
13:30 - 14:00	Training - Part II
14:00 - 14:30	Training - Part III
14:30 - 16:00	Posttest
16:00 - 16:30	Critique

RESULTS AND DISCUSSION

After training, performance improved from an overall pretest performance of 35% correct target identification to an overall posttest performance of 46%. The percent increase in performance for the vehicles tested are ordered as follows: 3/4 ton turck (146% improvement), 5 ton truck (55% improvement), jeep (50% improvement), APC (35% improvement), helicopter (31% improvement), tank (24% improvement), and 2 1/2 ton truck (8% improvement). Because of various error sources which were difficult to determine or beyond control (e.g., sound smapling problems and operator motivation), the 8% increase in correct identifications of the 2 1/2 ton truck could have occurred by chance. Therefore, the training was felt to prepare the operators inadequately for identification of the 2 1/2 ton truck. In subsequent investigations, special care should be given to improving the operator's capability for recognizing the 2 1/2 ton truck. The detailed results are reported in the following order: Vehicle Analysis, Learning Effect and F-4 Jet Analysis, and Operator Performance Differences.

Vehicle Analysis

The vehicles are considered in the following order: jeep, 3/4 ton truck, 2 1/2 ton truck, 5 ton truck, APC, tank and helicopter. The basic data are given as percent identification of each specific vehicle type. In order to maximize meaning to the Army Field Commander, estimates are provided of the level of performance that might be expected in the field under the ideal conditions of vehicles traveling alone and a high signal/noise ratio. Additionally, an attempt is made to determine the optimum mix of maximum percent identification and minimum transmission time (TT) for both untrained and trained UGS operators.

Jeep

Even though UGS operators regularly hear jeeps and jeep sound signatures, they have difficulty in differentiating them from the sound signatures of other vehicles (Table 5).

Table 5

Jeep Percent Identification

	Transmission Time (TT)				
	1 Sec	3 Sec	6 Sec	10 Sec	15 Sec
Before Training (BTRG)	13%	13%	29%	26%	36%
After Training (ATRG)	21%	24%	38%	47%	46%

Note: chance level is 12.5%

The best (BTRG) performance is with the 15 second TT currently used in the Army. BTRG, the commander can expect about 36% identification with a 15 second TT. However, note that (ATRG) about the same level of performance occurred with the 6 second TT (38% versus 36%), showing the value of training. Substantial performance is attainable with either the 10 second or 15 second TT. The highest expectation for trained operators is 47% identification with a 10 second TT.

3/4 ton

This truck was the most difficult vehicle. BTRG performance was the lowest of any target, perhaps because this vehicle is not heard as often as the others. Notice that BTRG performance does not appear to be affected by TT. Based upon these data, even if TT were lengthened, performance would not improve much, if any.

Table 6
3/4 Ton Truck Percent Identification

	Transmission Times (TT)				
	1 Sec	3 Sec	6 Sec	10 Sec	15 Sec
Before Training (BTRG)	15%	7 %	19%	15%	11%
After Training (ATRG)	31%	29%	38%	42%	29%

Note: chance level is 12.5%

However, operator performance substantially improved ATRG. Sound sampling problems probably had an effect (note that the 3 second TT and 15 second TT are similar for both BTRG, 7% versus 11%, and ATRG, 29% versus 29%. Given that a sampling problem occurred, it can still be concluded that 6 seconds is probably a sufficient TT length for the 3/4 ton truck ATRG and that roughly 36% recognition would be expected (36% is the average of the 6, 10, and 15 second TT ATRG).

2 1/2 Ton Truck

The training appeared not to have as strong an effect with this vehicle as with the others (Table 7). It is difficult to explain the low ATRG performance (29%) at the 6 second TT as purely sound sampling problems and UGS operator error.

Table 7
2 1/2 Ton Truck Percent Identification

	Transmission Times (TT)				
	1 Sec	3 Sec	6 Sec	10 Sec	15 Sec
Before Training (BTRG)	29%	32%	38%	44%	43%
After Training (ATRG)	33%	42%	29%	46%	53%

Note: chance level is 12.5%

Because of this inconsistency, it can only be concluded that the optimal TT is 10 seconds for both BTRG and ATRG. The expected percent identification BTRG is 44% while that for ATRG is 48%.

5 Ton Truck

The results for this vehicle are the most consistent over different TTs (Table 8). With untrained operators, the commander can expect about 25% identification of a 5 ton truck regardless of TT. After training, the commander can expect about 45% identification performance at either the 6 second, 10 second, or 15 second TT. The best ATRG performance is 44% recognition for a 6 second TT.

Table 8
5 Ton Truck Percent Identification

	Transmission Times (TT)				
	1 Sec	3 Sec	6 Sec	10 Sec	15 Sec
Before Training (BTRG)	24%	25%	26%	25%	24%
After Training (ATRG)	25%	33%	44%	43%	46%

Note: chance level is 12.5%

APC

BTRG the commander can expect about 39% of the APCs to be identified under the longest TT -- 15 seconds (Table 9). However, ATRG, the commander can expect about 50% identification performance for both the 10 second and 15 second TT. The reason for the low 15% performance of the 3 second TT ATRG is not known.

Table 9
APC Percent Identification

	Transmission Times (TT)				
	1 Sec	3 Sec	6 Sec	10 Sec	15 Sec
Before Training (BTRG)	14%	25%	25%	32%	39%
After Training (ATRG)	31%	15%	35%	47%	53%

Note: chance level is 12.5%

Tank

Other than the F-4 jet, the tank is the most recognizable sound signature (Table 10). Even untrained soldiers can identify about 50% of the tank sounds at 6, 10, and 15 seconds TT. After training, the soldiers can identify a little over 60% at 10 and 15 seconds TT and 50% at 3 and 6 seconds TT. The best BTRG performance is roughly 48% identification at 6 seconds TT (an average of the 6, 10, and 15 seconds TT). The best ATRG performance is roughly 62% identification at 10 seconds TT (an average of the 10 and 15 second TT).

Table 10
Tank Percent Identification

	Transmission Times (TT)				
	1 Sec	3 Sec	6 Sec	10 Sec	15 Sec
Before Training (BTRG)	25%	38%	47%	46%	51%
After Training (ATRG)	29%	50%	53%	61%	64%

Note: chance level is 12.5%

Helicopter

As shown in Table 11, the helicopter data shows peak performance at 6 seconds with declines at 10 seconds and 15 seconds. Since the declines are similar both BTRG and ATRG, they probably represent a sound sampling problem. For the helicopter, a sound sampling error would have a greater

effect on performance because only one data base run was available from which to provide samples for the three scenarios. For the other targets, three different data base runs were sampled--one data base run per set. Therefore, a sampling problem in one of the three data base runs would not have had as large an impact as in the case of the helicopter, in which only one data base run was available.

Table 11
Helicopter Percent Identification

	Transmission Times (TT)				
	1 Sec	3 Sec	6 Sec	10 Sec	15 Sec
Before Training (BTRG)	22%	22%	61%	42%	49%
After Training (ATRG)	24%	47%	68%	61%	58%

Note: chance level is 12.5%

The helicopter sound was also taken from a different data base than the other targets. Some electronic manipulations (enhancing volume, etc.) were performed that may have had an effect on operator performance. This does not explain why both BTRG and ATRG 6 second TT performances were high relative to the 10 and 15 second results. Probably the longer TT (10 seconds and 15 seconds) resulted in sounds resembling a truck because several helicopters were flying in procession. The overlapping sounds (roar) tended to mask out the fainter sounds usually heard from a helicopter before and after the closest point of approach (CPA). Because the roar was more or less continuous over the 10-15 second TT it may have appeared like the amount of time a truck would take rather than a helicopter. In essence, what was tested was not a single vehicle recognition condition but a multiple vehicle (or convoy) condition. Operator performance, therefore, was probably

unrealistically low in the case of the 10 and 15 second TT both BTRG and ATRG. However, whatever the sampling problem, training still improved performance.

To summarize, BTRG the commander can expect about 36% identification for a 6 second TT: ATRG the commander can expect about a 62% identification for a 6 second TT (an average for the 6 second, 10 second, and 15 second TT).

F-4 Jet and Learning Effects

The F-4 Jet was included as a non-target sound to add the realistic operator task of discriminating reportable sounds from typical battlefield noises. As obvious from Table 12, the BTRG and ATRG results are very similar, indicating no improvement. This probably happened because the F-4 was not included in Parts I and II of the training program but only in Part III which was largely confined to practice.

Table 12
F-4 Percent Identification

	Transmission Times (TT)				
	1 Sec	3 Sec	6 Sec	10 Sec	15 Sec
Before Training (BTRG)	46%	74%	86%	89%	88%
After Training (ATRG)	43%	69%	92%	90%	93%

Note: chance level is 12.5%

The best identification performance is 88% BTRG at 6 seconds TT and 92% ATRG at 6 seconds TT. With only 1 second and 3 seconds TT the commander can expect substantially lower percent recognition even with such a familiar sound as a jet plane. The similarity between the BTRG overall average score (76%) and ATRG overall average score (78%) suggests that learning effects resulting from practice during the two test administrations are minimal. (The F-4 jet was used only in Part III training).

An analysis was undertaken to assess the possible impact of learning within each test administration for all of the targets combined. Each pretest and posttest had three periods as shown in Table 13. The results indicate a practice effect which may level off after the 5th period.

Table 13

Number of Targets Identified in Each Period

PRETEST			POSTTEST		
Period 1 (1)	Period 2 (2)	Period 3 (3)	Period 1 (4)	Period 2 (5)	Period 3 (6)
297	337	383	404	461	446

A major lesson learned in this investigation is that a comprehensive test procedure and target familiarization program is needed before the pretest is administered to avoid a practice effect. Although twenty practice targets were given to the operators to learn the test procedure, the targets used were not similar to the actual targets in the test. Future research should use more practice trials using military targets.

Operator Performance Differences

Large spreads (ranges) in operator performance (using raw data) were apparent on both the pretest (24 to 65 correct identifications out of a possible 120) and posttest (33 to 95 correct identifications out of a possible 120). It is obvious that sound recognition ability varies greatly among operators. An analysis was conducted dividing the group into thirds based on an ordering of pretest scores. The results are shown in Table 14.

Table 14

Operators Arranged on the Basis of Pretest Performance (Raw Data)

Group	Operators	Pretest		Posttest	
	1	65		75	
	2	54		74	
Upper	3	54	Group	52	Group
Third	4	53	Average	69	Average
	5	51	44%	95	57%
	6	51		65	
	7	50		58	
	8	49		55	
	9	47		52	
	10	46		62	
	11	46		56	
Middle	12	44	Group	59	Group
Third	13	43	Average	43	Average
	14	42	36%	50	44%
	15	40		53	
	16	38		49	
	17	35		43	
	18	34		35	
	19	34		67	
Lower	20	34	Group	49	Group
Third	21	28	Average	36	Average
	22	28	26%	39	36%
	23	27		42	
	24	24		33	

Notice that the pretest performance of the middle group is the <u>same</u> as the posttest performance of the lower group. Also, the pretest performance of the upper group is the same as the posttest performance of the middle group. Since there are relatively few AAUs and COMMIKEs in Army units, only the most effective operators could be assigned to monitoring the acoustic sensors. The tapes used in this study or similar ones could be given to all UGS operators to determine who are the most talented operators for sound recognition.

SUMMARY OF RESULTS

The use of one's acoustic memory for aural sound recognition to the level of specific vehicle identification is a difficult perceptual task. Although UGS operators are regularly exposed to various vehicle sounds during Army life, this is no guarantee that they will be able to differentiate vehicle sounds from one another. In fact, some operators will do poorly on sound recognition tasks, as shown in this report. Only those operators in field units who have the better sound recognition ability should perform that task. One way of identifying the best operators is by using an objective test of performance similar to the tests in this research.

Estimates of the best combinations of recognition performance and transmission time are given below for the before training (BTRG) situation and the after training (ATRG) situation.

1.	Jeep	-BTRG - 36%/15 seconds ATRG - 47%/10 seconds
2.	3/4 Ton Truck	-BTRG - 13%/6 seconds ATRG - 36%/6 seconds
3.	2 1/2 Ton Truck	-BTRG - 44%/10 seconds ATRG - 48%/10 seconds (Possibly 6 seconds)
4.	5 Ton Truck	-BTRG - 25%/6 seconds ATRG - 45%/6 seconds
5.	APC	-BTRG - 39%/15 seconds ATRG - 50%/10 seconds
6.	Tank	-BTRG - 50%/6 seconds ATRG - 62%/10 seconds
7.	Helicopter	-BTRG - 36%/6 seconds ATRG - 62%/6 seconds

The above data suggest that trained operators need not listen to the sounds of vehicles traveling alone for more than 6 to 10 seconds. If they can't recognize the sound aurally within that period of time, chances are they will not appreciably improve performance with additional TT.

Based upon analyses of operator errors and problems, the following suggestions are made for the development of training material and future research concerning the acoustic remote sensor.

1. The test procedure familiarization program must be expanded in order to minimize practice effects during test administration.

2. The size of the pretest and posttest (120 sounds each) appeared adequate for data analysis purposes. However, the operators should not be given a posttest the same day as the pretest and training. The posttest should be given the following day with a short training refresher and a warm-up test.

3. Sound sampling for the 2 1/2 ton truck used in the training apparently was inadequate and may heve even confused the operators. Additional attention in future research should be given to the relative loudness intensities of all vehicles tested.

APPENDIX A - INSTRUCTOR GUIDE

Classroom Materials and Equipment

1. Tape recorder, cables, miscellaneous supplies
2. Headset and headset feeder
3. Blackboard

INSTRUCTOR GUIDE

ORIENTATION BRIEFING

Facilitator: Read the following:

I want to welcome everyone here today. We are glad that you could make it and can participate in the one-day exercise we have planned. We think you will find it interesting and worthwhile to your job in the Remote Sensor Platoon. We will be spending 30 minutes briefing you and giving you an orientation as to what it is all about. Before going any further I want to introduce myself and my associate and find out who you are.

- Introductions-Both HRB and Army -

Recent requirements in the Army Unattended Ground Sensor (UGS) Community have identified a critical need for human factors studies and training development in the area of monitoring acoustic Unattended Ground Sensors (UGS). The need for studies and training development is recognized by UGS field units, the United States Army Intelligence Center and School (USAICS) and the NATO project Avid Guardian in Europe.

Acoustic sensors are the best identification sensors in the Army today, but their full potential has not been realized primarily because of a lack of training and knowledge concerning what the operator can and cannot do. By participating in this exercise, you, the UGS operator, are helping to answer questions such as:

1. How well can an operator recognize different military-type vehicles by just listening to the sound that they make?
2. What difference does transmission time make, including very short ones?
3. To what extent can an operator be trained to increase his ability to recognize the sounds as to vehicle type?

The Army is interested in improving surveillance techniques to maximize information output and make the job easier for you. During these exercises, your task as a sensor operator will be to listen to tape recordings of military vehicles and report what you think you hear. Many of the skills you have acquired in school and on the job will apply. All of you may have had some personal experiences which will apply in that you have heard all of the vehicles at sometime in your life. Today you will hear recorded sounds of Army vehicles for different lengths of time which you will report out on a simple reporting form. You'll do this for an hour, receive some training, and then do another hour of interpreting. You will be given specific times to ask questions so that the planned exercise will not be interrupted. If the equipment seems to be malfunctioning, please inform one of us immediately.

You will hear taped sounds of military vehicles as you would hear them from an AAU or COMMIKE employed in a field exercise. However, the sounds are not contaminated with other sounds. In other words, these sounds are about the best you will hear for a particular vehicle in the field because they don't include the effects of wind, rain, malfunctions, or the sounds of other vehicles. You will record your answers using our procedures and forms. Since we know what made the sounds, we can score your answer sheets for accuracy. We don't expect 100% performance, but just that you try as hard as you can as though this was a field combat situation. Each of you will participate for the entire day. During this program you will be given appropriate breaks, lunch, etc. However, you must be here for <u>all</u> scheduled times or we cannot use your results. Is there anyone here that cannot participate in this exercise all day?

I would like to emphasize that we are not giving you a test to see how good an operator you are. We are here to improve the Army's capability for using the acoustic sensor. All we ask is that you interpret the sounds to the best of your ability and try to make sense out of what sometimes might appear to you to be rather difficult. We are also trying to see if we could cut down on the length of the signal to increase the life

of the batteries and reduce the detectability of the sensor. You are important because you as a group represent the hundreds of UGS operators that have and will be assigned to Remote Sensor Platoons, but the first to participate in this kind of exercise. The use of acoustic sensors may be influenced based upon what you can do.

It is not the purpose of this exercise to sample all possible vehicles or circumstances involving the use of acoustic sensors. This exercise does attempt to sample the sound signatures of certain types of vehicles in an uncontaminated situation using a certain type of sound recording system.

TEST PROCEDURE FAMILIARIZATION

Facilitator: Read the following:

During today's exercises, you will be listening to different sounds as you might hear in the field - either in war games or an actual conflict. For the purpose of this exercise, we are assuming that you are monitoring five non-commandable, acoustic UGSs. You have already placed each sensor along a different road - one sensor along each road - like this.

Facilitator: Draw the following illustration on the blackboard.

Facilitator: Read the following:

The roads have several turns and hills where the sensors are placed. Any vehicles traveling these roads will be forced into slowing down in the area of the sensors. Depending upon the vehicle and load, speed will probably vary between 5 mph and 10 mph. Your commander has tasked you with the job of monitoring these five sensors for early warning purposes. Your monitoring tent is five miles away. He knows that the aggressor force will be using all of these roads and he wants to know about everything that passes either down these roads or in the vicinity. Your commander has given you a Target Log which you will use to record target activity. Look at the Target Log that is being passed out now (Table A-1).

TABLE A-1

REMOTE SENSOR PLATOON
TARGET LOG

NAME _____

RANK _____ GROUP _____

DATE _____

TGT	JP	3/4T	2½T	5T	APC	TNK	HEL	OTHER	
1									
2									
3									
4									
5									
6									
7									
8									
9									
10									
11									
12									
13									
14									
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31									
32									
33									
34									
35									
36									
37									
38									
39									
40									

TGT	JP	3/4T	2½T	5T	APC	TNK	HEL	OTHER	
1									
2									
3									
4									
5									
6									
7									
8									
9									
10									
11									
12									
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36									
37									
38									
39									
40									

First, fill out the information that is requested in the upper right-hand corner. I'll wait while you do this (about one minute). Your commander is interested in <u>everything</u> that passes down these roads. He wants you to place a check mark or X in the appropriate column. Notice, however, that he is particularly interested in the seven target types listed at the top of the sheet. These target types are:

1. Jeeps (shown as JP)
2. 3/4-ton trucks (shown as 3/4T)
3. 2½-ton trucks (shown as 2½T)
4. 5-ton trucks (shown as 5T)
5. Armored personnel carriers (shown as APC)
6. Tanks (shown as TNK)
7. Helicopters (shown as HEL)
8. Other targets (shown as OTHER)

Are there any questions?

Your commander is interested in these particular targets, but if other activity occurs he also wants it reported. When you hear targets other than the seven we have just covered, he wants you to place a check mark or X in the "other" column (i.e., the column on the right-hand side).

We haven't mentioned this before, but each acoustic sensor is set by the manufacturer for a different transmission time. One sensor is set at:

15 seconds. Another is set at

10 seconds, another at

6 seconds, another at

3 seconds, and the last at

1 second.

Facilitator: Pass out the Practice Target Log (Table A-2) and read the following:

Before we go any further, we want to give you some practice in listening and recording. Fill out the upper right-hand portion of this Target Log. I'll wait. You will find the vehicles we are using for this practice interesting. Notice at the top of your Practice Target Log, three target types are listed. These are:

1. Volkswagen car (shown as VW)
2. Diesel train (shown as TRN)
3. Lawn mower (shown as LMo)

Are there any questions? We will now play the tape. You will be told the target number immediately before the target sound is given to you. For example, you will hear a voice say "target 1," then a few seconds later you will hear the sound of target 1 either for 1, 3, 6, 10, or 15 seconds. Remember, after you've recognized a sound, record your answer with a checkmark or X in the right column. If you can't recognize a sound as either a VW, TRN, or LMo, record your answer in the "other" column. Are there any questions? OK, everybody put on his earphones and let's go!

Facilitator: Play the Practice Tape and check to see that everybody understands the procedure. After the tape is finished read the school solutions to the operators. This generates enthusiasm and interest. The school solution is as follows. Let them know that the "other" target is a Plymouth station wagon.

REMOTE SENSOR PLATOON
PRACTICE TARGET LOG

NAME _____

RANK _____ GROUP _____

DATE _____

TGT	VW	TRN	LMo	OTH-ER					
1									
2									
3									
4									
5									
6									
7									
8									
9									
10									
11									
12									
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38									
39									
40									

Tape Counter Number	TARGET	PRACTICL	REPLICATION
START 001	1	TRN -	
001.5	2	LMO -	
002	3	VW -	
003.5	4	Other -	
004.5	5	VW	
005	6	Other	
007	7	VW	
009	8	Other	
	9	TRN	
	10	LMO	
	11	TRN	
	12	TRN	
	13	LMO	
	14	TRN	
	15	LMO	
	16	LMO	
	17	TRN	
025	18	LMO	
026	19	TRN	
STOP 027	20	LMO	

Facilitator: Now you will be given a tape containing the sounds of military vehicles. Remember to place check marks or X's on your Target Log and keep your target numbering correct.

Any questions? OK, everybody put on his earphones and lets go!

Facilitator: Play the Pretest Tape. Keep track of the three different replications in relation to the Target Log. Make sure each soldier starts on the left side of the Target Log. The pretest and posttest replication sequences for groups 1, 2, and 3 are shown below. The treatment conditions (transmission times and targets) are presented in Table A-3.

	PRETEST	
061	2	
128	3	GRP 1
002	1	
002	1	
061	2	GRP 2
128	3	
128	3	
002	1	GRP 3
061	2	

Table A-3. Pretest/Posttest Replications

SEQUENCE	REPLICATION 1	REPLICATION 2	REPLICATION 3
1	F-4 - 1 sec.	JEEP - 3 sec.	5T - 10 sec.
2	JEEP - 6 "	2½T - 6 "	M48 - 10 "
3	M48 - 6 "	APC - 6 "	F-4 - 1 "
4	3/4T - 6 "	5T - 10 "	M48 - 6 "
5	M48 - 3 "	3/4T - 3 "	APC - 1 "
6	5T -15 "	M48 - 15 "	M48 - 3 "
7	3/4T -15 "	F-4 - 1 "	2½T - 1 "
8	3/4T -10 "	APC - 10 "	F-4 - 15 "
9	M48 -15 "	3/4T - 10 "	2½T - 6 "
10	APC -15 "	F-4 - 3 "	JEEP - 6 "
11	F-4 - 3 "	APC - 15 "	JEEP - 15 "
12	5T -10 "	5T - 1 "	2½T - 10 "
13	HELI -10 "	JEEP - 15 "	3/4T - 10 "
14	JEEP - 3 "	2½T - 3 "	HELI - 6 "
15	HELI -15 "	M48 - 1 "	2½T - 3 "
16	F-4 -15 "	M48 - 6 "	APC - 6 "
17	2½T - 1 "	APC - 3 "	JEEP - 10 "
18	3/4T - 1 "	F-4 - 15 "	M48 - 1 "
19	M48 - 1 "	3/4T - 1 "	F-4 - 10 "
20	2½T - 3 "	F-4 - 6 "	5T - 1 "
21	HELI - 6 "	3/4T - 15 "	3/4T - 3 "
22	APC - 1 "	HELI - 15 "	3/4T - 15 "
23	2½T -15 "	M48 - 3 "	M48 - 15 "
24	5T - 6 "	HELI - 1 "	3/4T - 6 "
25	HELI - 1 "	5T - 6 "	APC - 10 "
26	3/4T - 3 "	HELI - 10 "	F-4 - 6 "
27	M48 -10 "	JEEP - 1 "	APC - 15 "
28	F-4 - 6 "	HELI - 3 "	HELI - 10 "
29	5T - 3 "	JEEP - 10 "	JEEP - 1 "
30	APC - 6 "	2½T - 10 "	APC - 3 "
31	JEEP - 1 "	M48 - 10 "	HELI - 15 "
32	F-4 -10 "	5T - 15 "	JEEP - 3 "
33	JEEP -10 "	JEEP - 6 "	HELI - 1 "
34	2½T - 6 "	5T - 3 "	2½T - 15 "
35	5T - 1 "	2½T - 15 "	5T - 6 "
36	APC -10 "	HELI - 6 "	3/4T - 1 "
37	HELI - 3 "	2½T - 1 "	5T - 15 "
38	APC - 3 "	APC - 1 "	F-4 - 3 "
39	JEEP -15 "	3/4T - 6 "	5T - 3 "
40	2½T -10 "	F-4 - 10 "	HELI - 3 "

TRAINING PROGRAM

UHER Tape Counter Number	
	PART 1: SINGLE TARGET (SOUND SIGNATURE) TRAINING
	Facilitator: Play Part 1 of the training tape
048	"During this phase of the program we will familiarize you with the seven targets that the commander is interested in. Notice again the targets at the top of the Target Log. For each of these targets you will be given a Study Resource Sheet. These sheets will familiarize you with the physical characteristics of the vehicles and aircraft. These characteristics may help you recognize the sounds that they make. After you are finished studying a Sheet, you will listen to the sound that that target makes. Try to draw from your own experience what each vehicle sounds like to you. To some of you, a particular vehicle might sound like a motor boat, or perhaps a Greyhound bus, or perhaps something else. In other words, draw a picture in your mind as to what each target sounds like to you. After you listen to the sound of each target, we will discuss the sound that it makes and answer any questions you
054	have about that target before proceeding to the next one."
	Facilitator: Conduct the same procedure for each target
	1. Pass out the Sheet (Resource Material) for the target. Give the soldiers several minutes to study the sheet, then have a discussion period. The Resource Material is presented in Illustration A-1 through A-7.
	2. Then play several minutes of a tape sequence of the target. Replay it or portions of it if the soldiers request it. Let them know they have this option.
	3. Conclude with a discussion responsive to the need of the soldiers. Ask, "What did it sound like to you?"

(Continued on page A-21)

STUDY SHEET A-1

JEEP: ¼-ton, 4x4, M151

Sound Signature: 5-10 mph

1. Single, Medium-pitch, engine drone
2. Frequent engine surges
3. Relatively quiet

GENERAL INFORMATION

This ¼-ton jeep represents the family of jeeps including the open-top scout. They all have a four cylinder gasoline engine and muffler. At low speeds, the jeep will be driven in low gear.

SOUND SIGNATURE INFORMATION

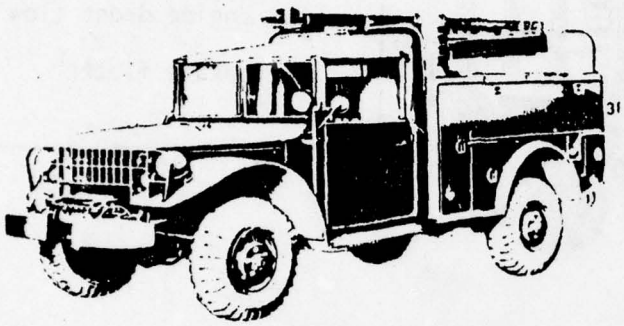
1. The jeep sounds much like an American passenger car with a bad muffler. It is not a noisy engine but has a single, medium-pitch drone.

2. Because the jeep will be traveling in low gear, you'll hear frequent engine surges because the accelerator is very sensitive to foot pressure. Even only slight changes in foot pressure will result in noticeable surges in the engine sound.

3. The jeep will usually sound quieter than most other military vehicles. Of course distance from the sensor and engine surges will affect loudness.

STUDY SHEET A-2

MAINTENANCE TRUCK: 3/4-ton, 4x4, M201, W/winch



Sound Signature: 5-12 mph

1. Single, medium-pitch, engine drone
2. Frequent engine surges

GENERAL INFORMATION

This 3/4-ton truck represents the family of 3/4-ton trucks. They have six cylinder gasoline engines and muffler.

SOUND SIGNATURE INFORMATION

1. The engine sounds like a civilian pick-up with a bad muffler. It sounds a little deeper than the jeep because it has a larger engine. It might sound alittle like a motorboat, especially if you hear the exhaust.
2. As with the jeep, slight changes in foot pressure on the accelerator produce noticeable changes in the sound signature.

CARGO TRUCK: 2½-ton, 6x6, M35 and M35A1, W/ and W/O winch

Sound Signature: 5-10mph

1. *Dual pitch*
   a. Engine whine (high pitch)
   b. Engine drone (low pitch)
2. Microphone flutter

GENERAL INFORMATION

This 2½-ton truck represents the family of 2½-ton trucks including enclosed cargo and light wrecker trucks. This truck is powered by a four cycle, multi-fuel diesel engine with an exhaust gas turbocharger which is like a muffler but not as effective. This truck has five forward speeds and of course, will use first gear at low speeds.

SOUND SIGNATURE INFORMATION

1. The engine noise usually has a high pitch whine from the turbocharger above the characteristic engine drone sound of a diesel engine. It gives a strong, penetrating sound. Microphone flutter may be noticeable when the vehicle is at CPA.

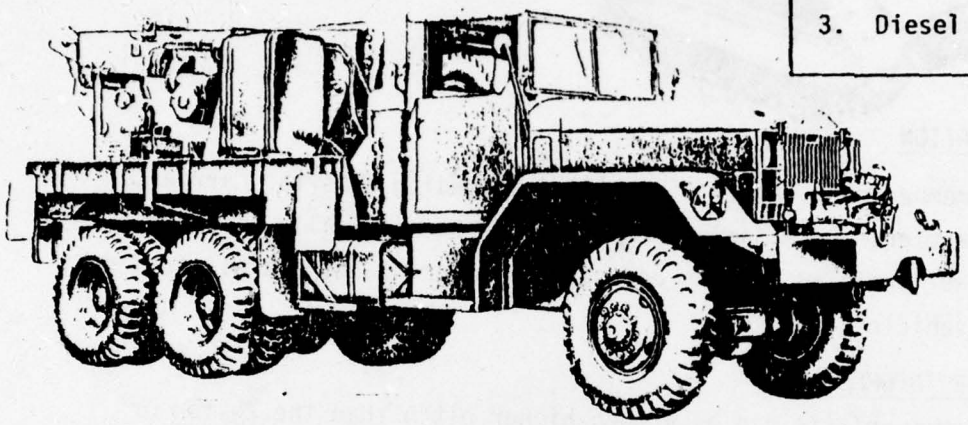
2. The engine exhaust comes out of an exhaust stack usually pointed to the curb side rather than to the rear because the noise is louder than that of a gasoline engine. If you are fortunate enough to hear the sound coming directly out of the engine exhaust, you will almost be able to hear individual cylinders as they fire with the characteristic diesel sound.

STUDY SHEET A-4

5-TON TRUCK: Medium wrecker, 6x6, M543, W/front winch

Sound Signature: 5-10 mph

1. Dual pitch
   a. Engine whine (high pitch)
   b. Engine drone (low pitch)
2. Engine exhaust rumble
3. Diesel revving-up



GENERAL INFORMATION

This 5-ton truck represents the family of 5-ton trucks including cargo carriers. This truck is powered by a four cycle, multi-fuel diesel engine with an exhaust gas turbocharger which is like a muffler but does not suppress as much sound. At low speeds, this truck will use first or second gear in the low transmission range. Gear changes are less frequent but more abrupt than a jeep or 3/4-ton truck.

SOUND SIGNATURE INFORMATION

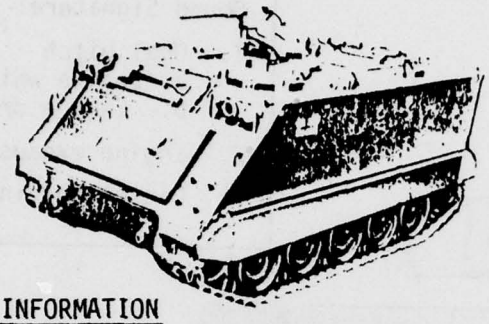
1. The engine noise has a dual pitch when under load or when revving-up. However, the engine whine is usually subdued and can be less than that of a 2½-ton truck. It has a heavy rumble (flutter) sound. Since the 5-ton has a lower gear ratio, it would tend to operate at higher RPM's than a 2½-ton traveling at the same speed. You would expect the sound to be heavier and deeper.

2. The engine exhaust is usually pointed to the curb side. If you are fortunate to hear the sound coming directly out of the engine exhaust, you will almost be able to hear individual cylinders as they fire with the characteristic diesel sound.

3. The characteristic sound of the diesel engine revving-up is a sure give-away to its identity.

STUDY SHEET A-5

PERSONNEL CARRIER, FULL-TRACKED: Armored, M113



Sound Signature: 5-10 mph
1. Wind-storm whistle
2. Soft engine hum
3. track clatter

GENERAL INFORMATION

This APC is a member of a family of vehicles including a mortar carrier, command post carrier, and missile prime mover. They basically have the same engine power train and tracks and sound similar. They are all termed light-tracked vehicles.

SOUND SIGNATURE INFORMATION

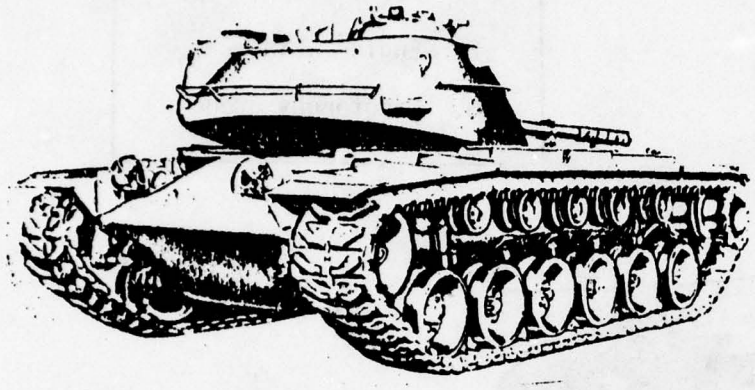
1. The wind-storm whistle can be a much higher pitch than the 2½-ton or 5-ton truck. It comes from a two stroke super charged Detroit diesel engine. The whistle can be so high-pitched that mechanics are supposed to wear ear protection when the engines are wound up in the shop.

2. The two-stroke diesel produces a smoother, steadier engine hum compared with the "boom-boom" rumble of the four-stroke truck engines as each cylinder fires. The engine exhaust points to the rear of the APC. It will sound smoother and steadier than the exhaust of a four-stroke truck engine. This happens because the two-stroke engine fires more often than its four-stroke cousin in trucks, because the cylinders fire on every down stroke - every down stroke is a power stroke. In the four-stroke truck engines every forth stroke is a power stroke. This means there are twice as many exhaust pulses in the APC.

3. Track noises (clatter) coming from the sprockets in the track will sometimes occur as they do with tanks. If you hear this you will be able to confirm your target identification.

STUDY SHEET A-6

COMBAT TANK: M48A1 Full-Tracked, 90mm gun



Sound Signature: 3-5 mph

1. Track squeak
2. Track clatter
3. Engine exhaust (when facing sensor) has a "hollow" sound.
4. Loud, lower pitch, full-throated engine drone

GENERAL INFORMATION

The M-48 engine has 12 cylinders and uses gasoline. It is classified as a heavy track vehicle.

SOUND SIGNATURE INFORMATION

1. Squeaks - The squeaks you hear from a tank come from steel contacting steel particularly when the surfaces are dry. With a bicycle you have a metal sprocket making contact with a metal chain. With a tank you have heavy, drive sprockets making contact with heavy, steel treads. The idler wheel may also be responsible for some noise.

2. Clatter - Clatter or popping happens when the rotating track tends to lag thereby slipping partially off the sprocket. The track then pops back into the seat with a clank or clatter. Track clatter is sometimes masked by the overall noise made by the tank.

3. Exhaust Noise - The exhaust is basically unmuffled allowing a distinctive loud, deep, "hollow" rumble to be heard from the four-stroke gasoline engine.

STUDY SHEET A-7

AH-1 COBRA: Attack helicopter

Sound Signature

1. Blade Slap (chop)
2. Engine whine
3. Monotonous drone

GENERAL INFORMATION

The Cobra represents the family of light, dual-blade helicopters. This helicopter has a turboshaft engine.

SOUND SIGNATURE INFORMATION

1. Blade slap is the distinctive chopping noise of the rotary blades against the air - the blades are slapping the air. Blade slap may not be noticeable when the helicopter is moving away.

2. Engine whine can uaually be heard when the helicopter is nearby or overhead. However, it can be masked by other sounds.

3. A monotonous, continuous drone (turbine engine noise) is usually heard first as the helicopter is approaching. Next, when the helicopter is near-by or overhead, engine whine and blade slap will usually occur. As the helicopter leaves the area, the engine whine is masked by the blade slap and then the monotonous tone takes over. One reason why the tone is monotonous is because the rpm is constant and there are no gear changes. If you hear rpm and gear changes then you know it can't be a helicopter.

Tape Counter Number	Cover the targets in this order. Do not encourage comparison discussions at this time. Total time - 40 minutes.
55-72.5	1. ¼-ton jeep (5 min) - Training Tape Sequence #1
72.5-79.5	2. 3/4-ton truck (5 min) - Training Tape Sequence #2
79-92.75	3. 2½-ton truck (3½ min) - Training Tape Sequence #3
93-106.75	4. 5-ton truck (5 min) - Training Tape Sequence #4
107-118.75	5. APC (5 min) - Training Tape Sequence #5
119-131.75	6. Tank (5 min) - Training Tape Sequence #6
119-	7. Helicopter (5 min) - Training Tape Sequence #7
131.75-	END

UHER Tape Counter Number	PART II: PAIRED - COMPARISON (TARGET SOUND SIGNATURES) TRAINING
	Facilitator: Play the tape for Part II: Paired - Comparison (Target Sound Signature) Training
143.5	"In this phase of the training you will be able to compare the sound signature of one target immediately with that of another. This technique may help you remember how each target sounds. We will present 22 of these paired comparisons. For the first comparison you will hear a ¼-ton jeep for 6 seconds followed immediately by a 3/4-ton maintenance truck for 6 seconds."
146	Comparison 1 - jeep first, 3/4-ton truck second
149.5	Comparison 2 - jeep first, 2½-ton second
151.5	Comparison 3 - jeep first, 5-ton truck second
153.5	Comparison 4 - jeep first, APC second
155.75	Comparison 5 - jeep first, tank second
158	Comparison 6 - jeep first, helicopter second
160	Comparison 7 - 3/4-ton truck first, 2½-ton truck second

UHER Tape Counter Number	
162.5	Comparison 8 - 3/4-ton truck first, 5-ton truck second
164.5	Comparison 9 - 3/4-ton truck first, APC second
167	Comparison 10 - 3/4-ton truck first, tank second
169	Comparison 11 - 3/4-ton truck first, helicopter second
171	Comparison 12 - 2½-ton truck first, 5-ton truck second
174	Comparison 13 - 2½-ton truck first, APC second
176	Comparison 14 - 2½-ton truck first, tank second
178.5	Comparison 15 - 2½-ton truck first, helicopter second
181	Comparison 16 - 5-ton truck first, APC second
183	Comparison 17 - 5-ton truck first, tank second
185	Comparison 18 - 5-ton truck first, helicopter second
187	Comparison 19 - APC first, tank second
190	Comparison 20 - APC first, helicopter second
192	END
	PART III: PRACTICAL EXERCISE
	Facilitator: Play the tape for Part III: Practical Exercise Make sure each operator has a Target Log.
194.5	"This phase of the program is a practical exercise to apply what you have learned about target sound signatures and give you further training. Target sounds will be given to you using five different transmission times: 1 second, 3 seconds, 6 seconds, 10 seconds, and 15 seconds. There will be a 15 second pause between each sound. Give your response to particular target sounds as they occur. Later, you will be given the answer to see how well you did. This immediate feedback will help you to understand which sounds you are having trouble with."
199	Good Luck!
	Facilitator: Play the tape for the Practical Exercise as shown below.

Tape Counter Number	SEQUENCE	PRACTICAL EXERCISE REPLICATION 1	
200	1	–	–
	2	3/4T	6 sec
	3	APC	1
	4	2½T	1
	5	HELI	6
	6	2½T	15
	7	5T	3
	8	JP	6
	9	5T	15
	10	M-48	10
	11	2½T	10
	12	JP	10
	13	HELI	3
	14	JP	1
	15	HELI	10
	16	5T	6
	17	HELI	1
	18	M-48	3
	19	HELI	15
	20	3/4T	15
	21	–	–
	22	3/4T	1
	23	–	–
	24	APC	3
	25	M-48	6
	26	M-48	1
	27	2½T	3
	28	JP	15
	29	5T	1
	30	APC	15

(Continued on next page)

Tape Counter Number	SEQUENCE	PRACTICAL EXERCISE REPLICATION 1	
	31	–	–
	32	3/4T	10
	33	APC	10
	34	–	–
	35	M-48	15
	36	3/4T	3
	37	5T	10
	38	APC	6
	39	2½T	6
	40	JP	3
271	END		

Facilitator: After the Practical Exercise Replication has been completed, give the answers to the operators so they can see how well they did. Have them place a circle to represent each correct answer. If a particular target is answered correctly, then a circle would surround the checkmark or X already there. If the target had been answered incorrectly, then the circle and checkmark (or X) would be in different columns. This feedback generates tremendous enthusiasm from both individual progress and competition standpoints. After self-scoring is completed, replay the training replication and instruct the operators to compare their answers with the correct answers while they are listening to the sound. Tell them that this will help them to see where they are making mistakes for future improvement. This concept may have to be repeated several times for a good connection to be made. Give a 15-minute break. During the break collect the used Target Logs and replace them with fresh ones. Also, change the tape during break from the training tape to the test tape.

Facilitator: After the break read the following.

Any questions? OK, everybody put on his earphones and let's go.

Facilitator: Play the Posttest Tape. Keep track of the three replications as shown below.

Tape Counter Number		
061	2	
128	3	GRP 1
002	1	
002	1	
061	2	GRP 2
128	3	
128	3	
002	1	GRP 3
061	2	